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Power Electronics Specialists Conference, PESC '94 Record., 25th Annual IEEE , June 1994
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[Abstract] [PDF Full-Text (340 KB)] **IEEE CNF**

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Design and implementation of a series voltage sag compensator under practical utility conditions

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Abstract:
Voltage sags have become one of the most important power quality concerns recent years. According to survey results across the US, voltage sags and shc duration power outages account for 92% of power quality problems encounte industrial customers. Voltage sags often cause undervoltage faults in various sensitive loads and subsequently interrupt the manufacturing processes. Suc interruptions often inflict severe losses for industries. In Taiwan, ROC, most h tech manufacturers use uninterruptible power supplies to avoid interruptions, the cost effectiveness of such an approach remains unclear. As the utility gric continues to improve the reliability of electric power, the inverter-based volta sag compensator has become a viable solution to prevent production interrup resulting from voltage sags. The existing sag compensation systems accompli fast response within a small fraction of a fundamental cycle by tracking the li voltages closely, and switch on the compensator whenever the voltage wavef deviate from the normal values. However, the utility voltages often contain transient spikes with amplitudes up to 200% resulting from switching of powe factor-correction capacitors, circuit breakers switchings, lightning strikes, and on. Such transient disturbances may trigger the sag compensator into operat its controller is very sensitive. The switching frequency of the sag compensat inverter is inadequate to compensate the narrow pulses of voltage spikes. Furthermore, the power semiconductor devices (like insulated gate bipolar transistors) of the inverter may also be damaged due to overvoltage by the s In this paper, a brief overview of power quality issues of a high-tech industry in Taiwan is provided to validate the need for ride-through technologies. A synchronous-reference-frame-based controller for the inverter-based voltage compensator is also presented. A sag detection mechanism is included in the controller for correct and prompt identification of voltage sags. Disturbances l voltage spikes are attenuated to avoid any false triggering of the compensatc overall system responds to voltage sags and restores the voltage back to bal

1.0 pu for critical loads within one-eighth to one-fourt- h of a cycle, which me requirement of industry standards like the SEMI-F47 standard. Simulation an laboratory test results are presented to verify the functionality of the propose system.

Index Terms:
circuit breakers compensation invertors power capacitors power factor correction p supply quality power system faults SEMI-F47 standard Taiwan circuit breakers swit false triggering avoidance high-tech manufacturers industrial customers insulated ga bipolar transistors inverter-based voltage sag compensator lightning strikes line volta tracking manufacturing processes interruption power quality problems power semico devices power-factor-correction capacitors ride-through technologies sag compensat sag compensator inverter sag detection mechanism sensitive loads series voltage sa compensator short-duration power outages switching frequency synchronous-referer frame-based controller transient disturbances transient spikes undervoltage faults uninterruptible power supplies utility conditions voltage spikes voltage waveforms

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11	BRS	L11	1	1 and (sag near2 correct$4)	USPAT	2003/12/17 16:47			0

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23	BRS	L23	1	1 and 22	USPAT	2003/12/17 16:56			0
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25	BRS	L25	0	1 and 24	USPAT	2003/12/17 16:59			0
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